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ABSTRACT

This article reviews the development of state funding formulas or guidelines for public higher education. Originally viewed as a means to distribute public funds in a rational and equitable manner, they now are complicated methodologies. Funding formulas are all-inclusive or itemized; most states use the itemized approach. There are three different computation methods for the itemized approach, all of which use variations of certain base factors such as head count, number of positions, area, full-time equivalent students (FTES), and credit hours. Formulas may differ among academic discipline, levels of enrollment, grades, and institution type. Functional areas where funding is used include research, instruction, public service, academic support, student services, institutional support, scholarships and fellowships, and plant operations. In 1996, 30 states reported using funding formulas for four-year institutions, although many are now eliminating formulas in favor of productivity and accountability methods to determine resource allocation since formula funding is as unable to recognize the range of objective and subjective differences among institutions. Although funding formulas do provide an objective allocation mechanism, they do not anticipate changes in the missions of institutions or changes in technology. Determining funding for higher education will continue to be part of a political process that involves compromise to preserve and improve quality of education while accommodating the changing condition of education. (Contains 21 references.) (NAV)

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State Funding Formulas for Public Four-year Institutions

Mary P. McKeown

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Mary P. McKeown

February 1996

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The State Higher Education Executive Officers is a nonprofit, nationwide association of the chief executive officers serving statewide coordinating boards and governing boards of postsecondary education. Fifty states, the District of Columbia and Puerto Rico are members.

State Funding Formulas for Public Four-year Institutions

The use of state funding formulas or guidelines for public higher education will reach the half-century mark in the 1990s. Despite the long history of use, controversy has surrounded state funding formulas for higher education since their inception. Likely, the only point upon which experts would agree is that there is no perfect formula. In fact, one observer has noted that "formula budgeting, in the abstract, is neither good or bad, but there are good formulas and bad formulas" (Caruthers 1989). Twenty years ago, some experts even were questioning whether formula usage was dead (Moss and Gaither 1976). Like Mark Twain, reports of its death were a little premature. Funding formula usage for public, four-year institutions may not be dead; however, the question remains: have funding formulas for four-year, public colleges and universities fulfilled their promise of identifying an adequate and predictable resource base and distributing those resources equitably?

Originally envisioned as simply a means to distribute public funds in a rational and equitable manner, funding formulas have evolved over time into complicated methodologies for allocating public funds. Although funding formulas provide some rationale and continuity in allocating state funds for higher education, formulas are designed and utilized for many purposes, including measurement of productivity. While the genesis of funding formulas may lie in rational public policy formulation, the outcome may not. Formulas are products of political processes, which implies that formulas result from compromise.

Formulas are used in almost every state in the allocation of state funds to elementary and secondary school districts. The stated public policy goal has been to attain equity in the distribution of funds through improvements in funding formulas. Federal and state courts have

presented many decisions on the equity and adequacy of elementary and secondary funding formulas, and relatively sophisticated analyses of elementary-secondary education funding formulas have been completed.

In contrast, the goal of equality of educational opportunity through equalized funding has not been accepted in higher education, and treatments of higher education formulas are largely descriptive in nature. Issues of student and taxpayer equity are not addressed often in the literature of higher education finance, and certainly are not driving forces in state funding formulas despite the federal government's intervention by litigation in several states (McKeown 1989). All but one of the states against which the Office of Civil Rights has filed suit in higher education are (or were) formula states; some have argued that, in these states, funding formulas may serve to perpetuate past inequities that existed among previously segregated institutions of higher education (McKeown 1986).

The use of funding formulas or guidelines in the resource allocation or budgeting process varies from state to state. In some states, the higher education coordinating or governing board may use formulas as a means of recommending to the legislature and governor the resources for each campus. In other states, the legislative or executive budget offices may use formulas to make their recommendations on funding (McKeown and Layzell 1994). Some states use formulas to determine the allocation of resources to each campus, given available funding. Although this latter use has been defined by some to be the only "true" formula funding, for purposes of this paper, states will be counted as using formulas if a formula or guideline is used at any point in the resource allocation process.

Development of an optimal, or best, formula is complex because there are differences in institutional missions and in the capacities of institutions to perform their missions. These differences do not negate the value of formulas but suggest that formulas can be used to provide

a fiscal base to which (or from which) funding can be added (or subtracted), if justified. Formulas typically are considered to be enrollment driven, since they are based on credit hours, students, or faculty members, which makes it relatively easy to evaluate change. If additional funds are justified, then formulas can provide the basis to target supplemental funding. Because formulas may be enrollment driven, when enrollments are steady or decline, funding may decrease. This aspect of formula use brought formulas under attack in several states when several institutions experienced declines in enrollment.

Debates over formulas because of declining enrollments and over the equitable distribution of resources to public institutions of higher education caused several states to critically examine methods used to recommend or distribute funding to public colleges and universities. When enrollments decline or remain constant, methods are sought that will provide additional resources. Development of new programs and services to meet the varied needs of a changing clientele may require different configurations of resources in addition to different programs. The student of the 21st century likely will have not only different non-instructional needs but also different preferences for instructional programs.

The student in the new century may be taught by alternative instructional delivery methods, which require a shift in the paradigm on funding. The trend in this direction is developing as more and more universities offer courses through telecommunications technology. In December 1995, the Western Governors' Conference announced a joint "virtual university" whose funding (and delivery of courses by telecommunications technology) would be shared by the western states (Bass 1995). Since the primary user states for the virtual university are formula states, funding for this university will require a shift in formulas, at least, and perhaps lead to the development of new methods of funding.

To accomplish the purpose of providing an equitable distribution of available state resources,

a majority of states have used funding formulas in budget development or in resource allocation to public higher education institutions. A formula is a mathematical representation of the amount of resources or expenditures for an institution as a whole or for a program at the institution (Boutwell 1973). Programs in this context refer to those categories into which expenditures are placed, as defined by the National Association of College and University Business Officers (NACUBO): instruction, institutional support, research, operation and maintenance of plant, public service, scholarships and fellowships, academic support, auxiliary enterprises, student services, and hospitals.

Many states provide funding for higher education based on these functional or budget programs, with the exception of auxiliary enterprises, and hospitals. These two areas usually are not funded by the state, and are not included in what are called "educational and general expenditures" (E&G). E&G expenditures are those that result from expenditures for the three basic missions of colleges and universities: instruction, research, and public service. Funding for the remaining categories may be based on formulas in the determination of the total resource allocation to the institution.

In most states, however, total institutional needs are not determined by a formula mechanism. Additions are made to the formula amounts to recognize special needs or special missions. Similarly, given political structures and competition for funds from other state agencies, the amount determined by a formula calculation may be reduced to conform to total funds available.

FORMULA DEVELOPMENT

Formulas have been considered the offspring of necessity (Gross 1979). The development of an objective, systematic method of dealing with the funding of many diverse institutions that served differing constituencies prompted many states to investigate and subsequently to begin using formulas (Miller 1964). Prior to 1946, institutions of higher education served a limited and fairly homogenous clientele. After World War II, enrollments jumped and each state had a variety of liberal arts colleges, land-grant colleges, teacher training colleges, and technical schools to meet the needs of its citizens.

As the scope and mission of the campuses increased and changed (i.e., teachers colleges becoming regional universities), so did the complexity of distributing resources equitably among competing campuses. Unfortunately, state resources did not keep pace with expanding enrollments and the competition for state funds became greater. Because no two campuses are ever alike, methods were sought to allocate available funds in an objective manner, to provide sufficient justification for additional resources to satisfy state legislators, and to facilitate inter-institutional comparisons.

The desire for equity was a prime factor in the development of funding formulas, but other factors served as catalysts: the desire to determine an "adequate" level of funding; institutional needs to gain stability and predictability in funding levels; and increased professionalism among college and university business officers (Miller 1964). The objective of equity in the distribution of state resources is to provide state appropriations to each campus according to its needs. To achieve an equitable distribution of funds required a distribution formula that recognized differences in size, clients, location, and the mission of the college (Millett 1974).

The concept of "adequacy" is more difficult to operationalize in the distribution of resources. What might be considered adequate for the basic operation of one campus would be considered inadequate for a campus offering similar programs but having a different client base. Indeed, the concept of adequacy has created operational problems in the distribution of funds to elementary and secondary education, where the definition of "need" is much more refined.

Texas was the first state to use funding formulas for higher education. By 1950 California, Indiana and Oklahoma also used funding formulas or cost analysis procedures in the budgeting or resource allocations process (Gross 1979). In 1964 sixteen states — Alabama, California, Colorado, Florida, Georgia, Indiana, Kentucky, Mississippi, New Mexico, New York, North Carolina, Ohio, Oregon, Tennessee, Washington, and Wisconsin — were identified as using formulas at some point in the allocation process (Miller 1964). By 1973 the number had increased to 25 states (Gross 1973), and increased to 33 by 1992 (McKeown and Layzell 1994).

Formulas evolved over a long period of time and contributed to a series of compromises between institutions, state coordinating agencies, and state budget officials. For example, institutions sought autonomy, while state coordinating or governing boards and budget officials sought adequate information to enable control over resources. Formula development involves tradeoffs and compromises between accountability and autonomy.

The trend in formula development in many states involves refinement of procedures, greater detail and reliability in the collection and analysis of information, and improvement in the differentiation between programs and activities. Some states appear to have used different methods to develop formulas. For example, Alabama adapted the formulas used by Texas to the particular circumstances of Alabama, and continues to modify the formulas to reflect circumstances specific to Alabama, and to incorporate judicial interventions. Adaptation rather than development of a new formula appears to be the preferred method because of the time and

cost required to do a good cost study. Accounting procedures are not refined enough in some states to permit the calculation of costs differentiated by academic discipline and level of student, and to separate professorial time into the multiple work products generated by carrying out the university's three main missions: teaching, research, and service. States continue to adapt formulas from other states because methods that work in one state may work equally well in another at considerable savings of time and resources.

Many formulas have been based on simple least-squares regression analysis or the determination of an "average cost" for providing a particular type of service. Others have been based on staffing ratios and external determinations of "standard costs." The key to the process seems to be the isolation or identification of variables or factors that are directly related to actual program costs (Anderes 1985b). Isolation of variables that are detailed, reliable, not susceptible to manipulation by a campus, and sufficiently differentiated to recognize differences in role and missions requires collection of myriad amounts of data. Data must be collected and analyzed in an unbiased manner that does not raise questions of preferential treatment for one campus or sector. For this reason, statewide boards or other state agencies have been given responsibility for formula development.

For a formula to be effective, several criteria should be met (Miller 1964):

1. Formula development should be flexible.
2. Formulas should be used for budget development, not budget control.
3. Formulas should be related to quantifiable factors.
4. Data should be consistent among institutions.
5. Normative data should reflect local and national trends.
6. The formula should be useful to institutions, boards, other state agencies, and the legislature.

Formula Advantages and Disadvantages

States use funding formulas for a variety of reasons, including these advantages among the reasons for use:

1. Formulas provide an objective method to determine institutional needs equitably.
2. Formulas reduce political competition and lobbying by the institutions.
3. Formulas provide state officials with a reasonably simple and understandable basis for measuring expenditures and revenue needs of campuses, and determining the adequacy of support.
4. Formulas enable institutions to project needs on a timely basis.
5. Formulas represent a reasonable compromise between public accountability and institutional autonomy (Millett 1974).
6. Formulas ease comparisons between institutions.
7. Formulas permit policymakers to focus on basic policy questions.
8. Formulas promote efficiency in institutional operation.

State funding formulas also can provide for equity among institutions depending on how the formulas are constructed. Two types of equity achieved through formula use are horizontal equity and vertical equity. Horizontal equity is defined as the equal treatment of equals while vertical equity is defined as the unequal treatment of unequals. An example of an horizontal equity element is a formula that provides a fixed dollar amount for one credit hour of lower division English instruction, no matter where the class is taught. Texas and Alabama use this type of element in their instruction funding formulas. An example of a vertical equity element in a formula would be the allowance of $2.80 per gross square foot (GSF) of space for maintenance of a frame building, but $3.20 per GSF for maintenance of a brick building.

On the other hand, formulas do have shortcomings, and there have been many heated debates over whether the advantages of formulas outweigh the down side of use. Some disadvantages of funding formulas are the following:

1. Formulas may be used to reduce all academic programs to a common level of mediocrity by funding each one the same, since quantitative measures can not assess the quality of a program.
2. Formulas may reduce incentives for institutions to seek outside funding.
3. Formulas may perpetuate inequities in funding that existed before the advent of the formula since formulas may rely on historical cost data (Millett 1974).
4. Enrollment driven formulas may be inadequate to meet the needs of changing client bases or new program initiatives (Halstead 1974).
5. Formulas cannot serve as substitutes for public policy decisions (Miller 1964).
6. Formulas are only as accurate as the data on which the formula is based.
7. Formulas may not provide adequate differentiation among institutions.
8. Formulas are linear in nature and may not account for sudden shifts in enrollments and costs (Boutwell 1973).

Formula Approaches

Formulas reflect one of two computational approaches: the all-inclusive approach, where the total entitlement or allocation for the program area is determined by one calculation; and the itemized approach, where more than one calculation or formula is used in each budget area. Most states use the latter.

Computational Methods

Three computational methods have been identified under which every formula calculation can be classified: (1) rate per base factor unit (RPBF); (2) percentage of base factor (PBF); and (3) base factor-position ratio with salary rates (BF - PR/SR) (Moss and Gaither 1976). The rate per base factor method starts with an estimate of a given base, such as credit hours or full-time equivalent students (FTES), and then multiplies that base by a specific unit rate. Unit rates generally have been determined previously by cost studies, and can be differentiated by discipline, level, and type of institution.

PBF assumes that there is a specific relationship between a certain base factor like faculty salaries and other areas like departmental support services. The PBF method can be differentiated by applying a varying percent to levels of instruction or type of institution (Miller 1964), but this is unusual. Reportedly, PBF was developed because of the perception that all support services are related to instruction, the primary mission of a college or university (Boling 1961).

BF-PR/SR is based on a predetermined optimum ratio between a base factor and the number of personnel; for example, ratios such as student/faculty and credit hours per faculty member are used. The resulting number of faculty positions determined at each salary level then is multiplied by the salary rate for that level, and the amounts totaled to give a total budget requirement. BF-PR/SR also is used commonly in plant maintenance, and is the most complex of the computational methods.

Base Factors

Base factors used in most formulas can be classified into five categories: (1) head count; (2) number of positions; (3) square footage or acreage; (4) FTES; and (5) credit hours. Square footage or acreage is used most often in operation and maintenance of plant, while credit hours,

FTES, or positions are the most prevalent bases in the instruction, academic support, and institutional support areas. Head count is used as the base unit in student services and scholarships and fellowships.

Differentiation

Formulas may differentiate among academic disciplines (such as education, sciences, and architecture), levels of enrollment (freshman and sophomore {called lower division}, junior and senior {called upper division}, masters, and doctoral), and types of institutions (community colleges, baccalaureate institutions, and research universities). Recently, some states like Kentucky and Alabama have introduced differentiation for historically black institutions as an institutional type.

States found it necessary to introduce factors that differentiate among institutions in funding formulas because each institution, if examined closely enough, is different and has a different mission and mix of program offerings. Differentiation is used to recognize that there are legitimate reasons for costs to vary, including economies and diseconomies of scale, method of instruction, and class size. Differentiation became more prevalent and more complex as accounting and costing methods improved and reliable cost data became available.

Differentiation is especially commonplace in formulas used to calculate funding requirements for the instruction program area. All of the states using formulas for instruction differentiate by discipline, institutional type, or level of enrollment. Only a few formulas in other budget areas differentiate by these three types of factor.

FORMULA USE BY THE STATES

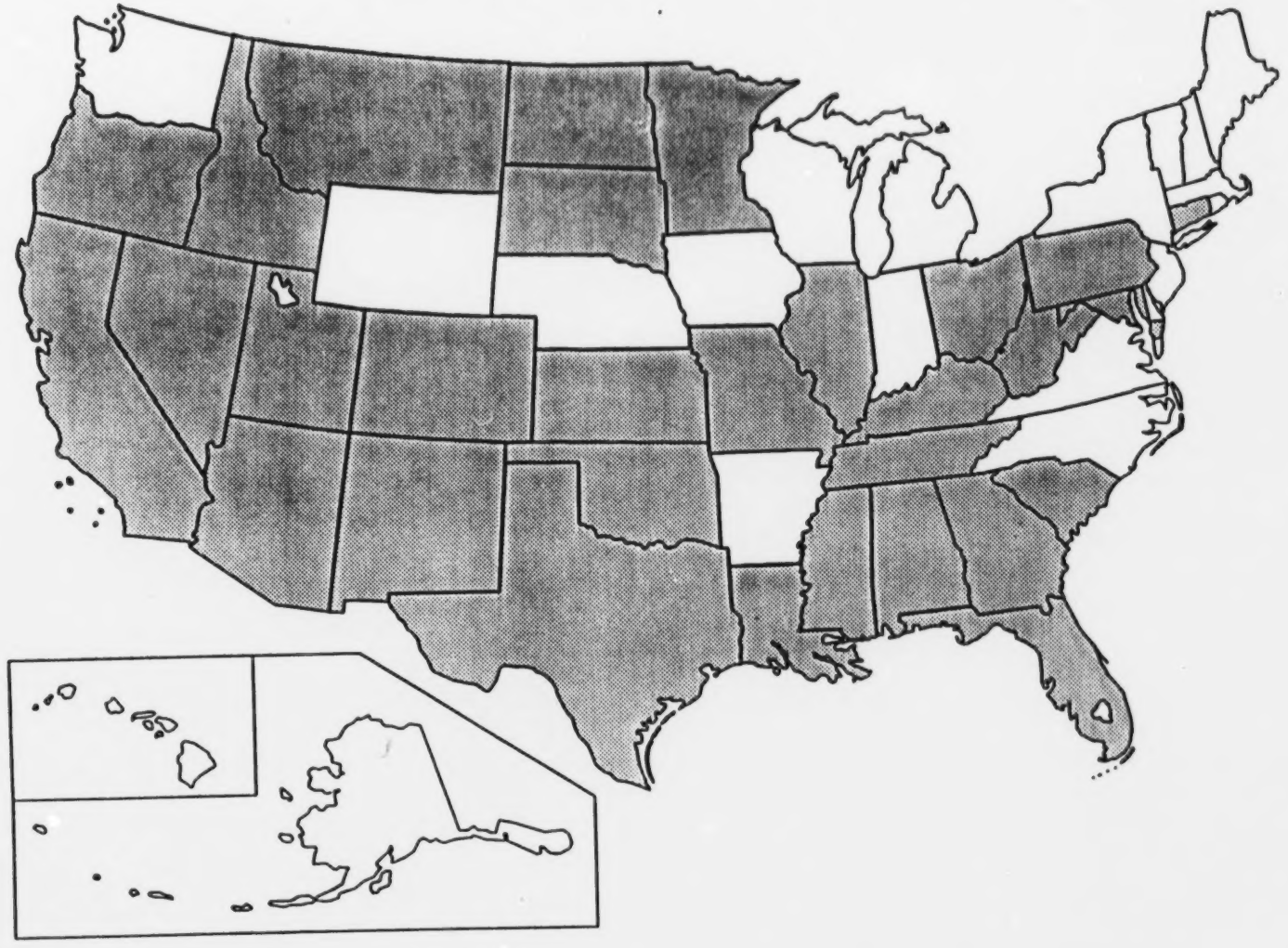
In 1996, 30 states report[1] that they are using funding formulas in the budget or resource allocation process for four-year public institutions. Twenty states indicate that they are in the process of revising current formulas or adopting new formulas. The number of states employing formulas changes from year to year, since states continually adopt, modify, and drop formulas and since what one person may consider a formula may be called by another name by another person (Meisinger 1976). For example, Louisiana typically is identified as a formula state although the person responding to the survey used to collect data for this chapter indicated Louisiana was not using formulas in 1996. States identified as using funding formulas, peers, or quality/outcome measures for four-year public higher education institutions in 1996 are listed in Table 1 and shown in Figure 1.

Although all the southern states except North Carolina have used funding formulas over the past twenty years, and have been leaders in formula development and innovation, that picture has changed somewhat since 1992. Virginia and Arkansas completely dropped the use of formulas in the resource allocation or budgeting process, and most of the other southern states have modified their formulas since 1992. Of the 13 western states, all except Washington, Hawaii, Wyoming and Alaska used formulas, while eight of the thirteen midwestern states and two of the ten northeastern states used formulas. California has a formula, but has suspended distribution of resources during the current budgetary crisis.

[1] Data were obtained from a survey of each state's SHEEO agency.

Figure 1

States Using Funding Formulas in 1996



Shaded states use formulas.

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Table 1
Comparison of Funding Formula Usage
Among the States, 1984, 1992, and 1996

State	Using Funding Formulas			Using Peers			Using Quality Outcome Factors		
	1984	1992	1996	1984	1992	1996	1984	1992	1996
Alabama	X	X	X		X	X			
Alaska		X							
Arizona	X	X	X		X	X			X
Arkansas	X	X			X	X			X
California	X	X	X		X	X			
Colorado	X	X	X						
Connecticut	X	X	X			X	X		X
Delaware									
Florida	X	X	X		X	X	X		X
Georgia	X	X	X			X	X		
Hawaii						X	X		
Idaho		X	X			X	X		
Illinois	X	X	X	X	X	X			X
Indiana					X	X			
Iowa					X	X			
Kansas	X	X	X		X	X			
Kentucky	X	X	X	X	X	X	X	X	
Louisiana	X	X	X		X	X	X		
Maine						X			X
Maryland	X	X	X				X		
Massachusetts	X							X	
Michigan	X								
Minnesota	X	X	X				X		X
Mississippi	X	X	X		X	X		X	X
Missouri	X	X	X		X		X	X	X
Montana	X	X	X		X	X			
Nebraska					X	X			
Nevada	X	X	X			X	X		
New Hampshire									
New Jersey	X						X	X	
New Mexico	X	X	X			X			
New York	X								
North Carolina					X	X		X	
North Dakota	X	X	X		X	X		X	
Ohio	X	X	X				X	X	X
Oklahoma	X	X	X		X	X			
Oregon	X	X	X		X	X			
Pennsylvania	X		X						
Rhode Island					X	X			X
South Carolina	X	X	X		X	X			
South Dakota	X	X	X						
Tennessee	X	X	X		X	X	X	X	X
Texas	X	X	X		X	X			
Utah		X	X		X	X			
Vermont						X			X
Virginia	X	X			X	X	X	X	X
Washington	X			X	X	X	X		
West Virginia	X	X	X		X	X			
Wisconsin	X				X	X			
Wyoming					X	X			
N	36	32	30	3	28	36	15	10	14

Among the states there is some variety in the type and number of formulas and in the functional or budget areas for which formulas are used. The number of formulas used by the states in each of eight NACUBO functional areas is displayed in Table 2. Of the 30 states identified as using formulas, only Kentucky, Maryland, and Mississippi have at least one formula in each functional area, but twelve states had at least six formulas and Kansas, Idaho, and Arizona have only one basic formula.

Of the states using formulas, twenty-two have only one formula for instruction, while Oregon has four, one of each of the cost areas related to instruction. The majority of states applied formulas to all institutions but differentiate among types. Texas uses 13 formulas to compute budget requirements for E&G expenditures and South Carolina uses twelve. In thirteen of the states, more than one computational formula is used to determine academic support needs. Since most states have a separate formula for determining library needs, the academic support area (which includes libraries, academic computing support, and academic administration) usually will have expenditure needs computed by more than one formula. Academic support is an area for which the itemized approach generally is used.

These data reflect a watershed change in the use of funding formulas that will be discussed in more detail later. Briefly, it appears that states are beginning to eliminate the use of formulas and substitute productivity or accountability methods to determine resource allocations. Other states that previously had used formulas now use incremental budgeting with base budgets that were computed by formula in prior years; this method implies a formula base. These are major shifts apparently away from equity and adequacy goals toward goals of accountability and efficiency.

Table 2

NUMBER OF FORMULAS USED BY THE STATES IN 1996 BY FUNCTIONAL AREA

State	Instruction	Research	Public Service	Academic Support	Student Services	Institutn'l Support	Scholar & Fellowshp	Plant Operations
Alabama	1	1	1	2	1	1		1
Arizona	*			*	*	*		*
California	*	*	*	*		*		*
Colorado #								
Connecticut	1			3				5
Florida	2	*	*	3	1	1		3
Georgia	1	*		1	*	*		1
Idaho	*							
Illinois	*							
Kansas	*	*	*	*	*	*		*
Kentucky	1	1	1	5	1	1	1	1
Louisiana	*	*		*	*	*		*
Maryland	1	1	1	2	1	1	1	3
Minnesota	*			*	*	*		*
Mississippi	2	1	1	2	1	1	1	1
Missouri	1			2	1	1		1
Montana	2	*	*	*	*	*	1	
Nevada	2			2	1	1		2
New Mexico	1			1	1	1		1
North Dakota	1			2	*	*		2
Ohio	*	*	*	*	*	*	*	1
Oklahoma	*	1		6	1	3		5
Oregon	4	*	*	**	**	**		1
Pennsylv.	*							
South Carolina	1	1	1	2	1	1		5
South Dakota	*	*		*	*	*		
Tennessee	1		1	2	1	1		1
Texas	2	1		2	2	1		5
Utah	*			*	*	*		*
West Virginia	*	1		*	*	*		*

* or ** indicates more than one functional area combined in one formula.
# Colorado distributes by formula funding for productivity, enrollment increases, and adult literacy. These formulas do not correspond to functional area analysis.

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Instruction Formulas

This category includes all expenditures for credit and non-credit courses; for academic, vocational, technical, and remedial instruction; and for regular, special, and extension sessions. Excluded are expenditures for academic administration when the primary assignment is administration (such as deans) (NACUBO 1988). Instruction is the most complex, and most expensive, component of an institution's expenditures. Because of its importance, identification of appropriate cost factors is critical to the validity of the formula development process. Summary information on the instruction formulas used by the states is displayed in Table 3.

Table 3
Instruction Funding Formulas

	Calculation Method			Approach		Base			Differentiation			Costs	
State	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Head Count	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari-able
Alabama	X				X	X			X	X			X
Arizona*			X		X	X		X		X			X
California*			X		X	X		X	X	X	X	X	X
Connecticut			X		X	X		X	X	X	X		X
Florida	X		X		X	X		X	X	X	X		X
Georgia			X		X	X		X	X	X			X
Idaho*	X			X		X			X	X	X		X
Illinois*			X		X	X			X	X	X		X
Kansas*	X				X	X				X	X	X	X
Kentucky	X				X	X			X	X	X		X
Louisiana*	X				X	X			X	X	X		X
Maryland	X				X	X			X	X	X		X
Minnesota*	X				X	X			X	X	X		X
Mississippi		X	X		X	X			X	X	X		X
Missouri	X				X	X			X	X			X
Montana	X		X		X	X		X	X	X			X
Nevada			X		X	X		X		X			X
New Mexico	X		X		X	X			X	X	X		X
North Dakota	X		X		X	X			X	X	X		X
Ohio*	X				X	X		X	X	X	X	X	X
Oklahoma*	X				X	X		X	X	X	X		X
Oregon		X	X		X	X			X	X	X		X
Pennsylvania*			X		X	X		X		X		X	X
South Carolina			X		X	X		X	X	X	X		X
South Dakota*			X		X	X		X	X	X			X
Tennessee			X		X	X		X	X	X	X		X
Texas	X				X	X			X	X	X	X	X
Utah*			X		X	X			X	X	X		X
West Virginia*	X				X			X			X		X

*indicates more than one functional area included in this formula

Since the instruction program is the major component of expenditures at institutions of higher education, formulas for this activity are quite complex. Each state using formulas explicitly or implicitly utilizes at least one formula for instruction. Each state provides differential funding for activities within the instruction program to recognize differences in costs by level of instruction and among academic disciplines. Over time, formulas for instruction have become more complex in part because improvements in cost accounting procedures have resulted in more accurate data.

States use both the all-inclusive approach and the itemized approach in the instruction area, but the majority use the itemized. In the formula(s) for instruction, most states recognize differences in institutional roles and missions, in the mix of classes by level and by academic discipline, and in teaching method; that is, all the states using instruction formulas differentiate. Explicitly, the states have attempted to distribute in an equitable manner state funds for the instructional operations of public institutions within the state by recognizing the equality of class credit hours by discipline and level and the differences in institutional roles and missions.

Since the formula allocations provide varying amounts based on enrollments by level and discipline, each institution in the state may receive differing amounts for instruction and different amounts per student from the formulas. Moreover, the recognition of the differences promotes achievement of vertical equity (i.e., the unequal treatment of unequals).

An example of a simplified formula for instruction follows. Student/faculty ratios by level by discipline vary in the formula.

> Instruction funding = the sum of (the number of faculty positions per discipline times the average faculty salary for that discipline), where the number of faculty positions is determined by student/faculty ratios and the number of FTE students is determined by credit hours by level.

Research Formulas

This category includes expenditures for activities designed to produce research outcomes (NACUBO 1988). Explicitly, or implicitly by inclusion with at least one other functional area, 17 states have a formula that provides funds for the research budget area (Table 4).

Table 4
Research Formulas

	Calculation Method			Approach		Base			Differentiation			Costs	
State	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Spons Resear	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari-able
Alabama		X		X		X			X	X			X
California*			X		X	X			X	X	X	X	X
Florida*			X		X	X			X	X	X		X
Georgia			X		X	X		X	X	X			X
Kansas*	X				X	X				X	X	X	X
Kentucky		X		X			X					X	X
Louisiana	X				X	X			X	X	X		X
Maryland		X			X	X			X	X	X		X
Mississippi	X				X			X	X				X
Montana*	X		X		X	X		X	X	X			X
Oklahoma*	X				X	X		X	X	X	X		X
Oregon		X		X				X			X		X
Pennsylvania*			X		X	X		X		X		X	X
South Carolina		X		X			X						X
South Dakota*			X		X	X		X	X	X			X
Texas	X				X			X					X
West Virginia	X			X				X					X

*indicates more than one functional area included in this formula

Florida's formula is complex and involves computations related to the magnitude of research activities engaged in at each institution. The number of research positions is calculated based on a ratio by specific department and is then multiplied by a specified salary rate. Kentucky uses a formula that calculates a level of support that recognizes differing roles and missions in research among institutions. A sample research formula is shown as follows:

Research amount = 5% of outside funding for research

South Carolina allocates 25 percent of the prior year sponsored and non-general fund

research expenditures. Texas provides an amount equal to the number of full-time equivalent faculty times a dollar amount. Alabama's budget formula for research provides two percent of instruction and academic support allocations, plus five percent of sponsored research dollars expended in the last year for which data were available.

Most of these formulas incorporate horizontal and/or vertical equity features. Features that provide a set amount per position (Texas) or matching funds for each dollar of sponsored research (Alabama and South Carolina) provide horizontal equity, or the equal treatment of equals. Formulas that provide research support based on institutional type like Kentucky's or Oklahoma's meet the goal of providing vertical equity.

Public Service Formulas

This category includes funds expended for activities that primarily provide noninstructional services to individuals and groups external to the institution (NACUBO 1988). Alabama, Kentucky, Maryland, Mississippi, Tennessee, and South Carolina are the only states that use an explicit formula approach for the funding of public service activities (Table 5). In Florida public service positions are generated based on ratios specific to disciplines, and then multiplied by a salary amount per position. South Carolina provides 25 percent of prior year sponsored and non-general fund public service expenditures, while Alabama's funding formula is two percent of the combined allocations for instruction and academic support. A sample of a public service formula is shown below.

Public service allocation = .02 (instruction + academic support)

Table 5
Public Service Formulas

State	Calculation Method			Approach		Base			Differentiation			Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Itemized	Credit Hours	Expend Mission	FTES/ FTEF	Discipline	Level	Type of Inst.	Fixed	Variable
Alabama		X		X		X			X	X			X
California*			X		X	X			X	X	X	X	X
Florida*			X		X	X			X	X	X		X
Kansas*	X				X	X				X	X	X	X
Kentucky	X				X	X			X	X	X	X	X
Maryland		X			X	X			X	X	X		X
Mississippi	X			X			X				X		X
Montana*	X		X		X	X		X	X	X			X
Oklahoma*	X				X	X		X	X	X	X		X
Pennsylvania*			X		X	X		X		X			X
South Carolina		X		X			X						X
Tennessee		X			X	X		X	X	X	X	X	X

*indicates more than one functional area included in this formula

Academic Support Formulas

Table 6 displays summary information on the academic support formulas used by the states. The category academic support includes funds expended to provide support services for the institution's primary missions of instruction, research, and public service. The area includes expenditures for libraries, museums, and galleries; demonstration schools; media and technology, including computing support; academic administration including deans; and separately budgeted course and curriculum development (NACUBO 1988). However, costs associated with the office of the chief academic officer of the campus are included in the institutional support category.

To fund the library component of the academic support category, Alabama, Connecticut, Florida, Georgia, Kentucky, Maryland, Mississippi, Missouri, Nevada, Oregon, South Carolina, Tennessee, and Texas have at least one formula. Texas allocates an amount per credit hour differentiated by level of instruction.

Table 6
Academic Support Formulas

State	Calculation Method			Approach		Base			Differentiation			Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Head Count	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari able
Alabama	X	X			X	X			X	X			X
Arizona*			X		X	X		X		X			X
California*			X		X	X			X	X	X	X	X
Connecticut	X		X		X	X	b	X		b	X	X	X
Florida	X		X		X	X	X	X	X	X	X		X
Georgia*		X			X	X			X	X			X
Kansas*	X				X	X				X	X	X	X
Kentucky	X	X			X	X	X			X	X	X	X
Louisiana*	X				X	X			X	X	X		X
Maryland	X	X			X						X		X
Minnesota*	X				X			X	X	X	X		X
Mississippi		X			X	X		X	X	X	X		X
Missouri	X				X	X			X	X			X
Montana*	X			X									X
Nevada	X	X			X	X		X		X		X	X
New Mexico	X	X			X	X				b	X		X
North Dakota	X				X			X		X			X
Ohio	X				X	X		X	X	X	X	X	X
Oklahoma*	X				X	X		X	X	X	X		X
Oregon	X	X			X	X	b	X	X	b	X	X	X
Pennsylvania*	X				X	X		X				X	X
South Carolina		X			X	X			X	X			X
South Dakota*			X		X	X		X	X	X			X
Tennessee	X	X			X			X			X		X
Texas	X				X	X				X		X	X
Utah*	X		X		X	X			X	X	X		X
West Virginia*	X				X			X			X		X

* indicates more than one functional area included in this formula
b indicates the state uses the Association of College Research Libraries formula

Standards on the size of library collections, number of support personnel, and other factors have been developed by the American Library Association (ALA) and the Association of College Research Libraries (ACRL). Formulas to apply these standards, like the Voight formula and the Clapp-Jordan formula, have been developed so that institutions may determine if their library holdings meet the minimum requirements established by professional librarians. Only three states use a library formula that would permit meeting the ACRL criteria; however, no formula or standard currently in use accounts for the changes in resource requirements necessitated by

increasing use of technology. In fact, the ALA and ACRL standards on size of collection do not consider the use of the "virtual library" found on the Internet where the text of some "books" may be accessed on the computer networks. These technological changes in media availability certainly will have profound impacts on funding of libraries, but such changes have not yet been reflected in funding formulas. An example of an academic support formula is shown below.

Academic support funding = .05 (instruction funding)

Florida, Kentucky, Missouri, South Carolina, and Texas each have at least one formula for other components of the academic support category. South Carolina calculates an amount based on a percentage of instructional costs. Since the instructional cost allocation includes vertical equity components, academic support calculations based on instruction implicitly also include vertical equity components to provide an unequal amount for unequals.

Student Services Formulas

This expenditure category includes funds expended to contribute to a student's emotional and physical well-being and intellectual, social and cultural development outside of the formal instruction process. This category includes expenditures for student activities, student organizations, counseling, the registrar's and admissions offices, and student financial aid administration (NACUBO 1988). (See Table 7.)

Table 7
Student Services Formulas

State	Calculation Method			Approach		Base			Differentiation			Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Head Count	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari-able
Alabama	X				X		X					X	X
Arizona*			X		X	X		X		X			X
Florida	X				X		X	X		X	X		X
Georgia*		X			X	X			X	X			X
Kansas*	X				X	X				X	X	X	X
Kentucky	X				X		X				X	X	X
Louisiana*	X				X	X			X	X	X		X
Maryland	X			X									X
Minnesota*	X				X			X	X	X	X		X
Mississippi	X				X	X		X				X	X
Missouri	X				X	X			X	X			X
Montana*	X		X		X	X		X	X	X			X
Nevada			X		X		X	X			X	X	X
New Mexico			X		X		X					X	X
North Dakota*	X				X		X			X		X	X
Ohio*	X				X	X		X	X	X		X	X
Oklahoma*	X				X	X		X	X	X	X		X
Oregon	X				X		X					X	X
Pennsylvania*	X				X	X		X				X	X
South Carolina	X				X	X	X					X	X
South Dakota*			X		X	X		X	X	X			X
Tennessee	X				X	X	X	X	X		X		X
Texas	X				X		X					X	X
Utah*			X		X	X			X	X	X		X
West Virginia*	X				X			X			X		X

* indicates more than one functional area included in this formula

The student services formulas used by Alabama, Kentucky, South Carolina, and Texas provide a different amount per head count or FTES. As the size of the institution increases, the rate per student decreases to recognize economies of scale. The formula implicitly does this by adding an amount per weighted credit hour to a base. Such a calculation inherently recognizes economies of scale. Each of these formulas attempts to provide vertical equity in the distribution of resources by allocating unequal amounts to institutions of unequal size. A sample student services formula follows.

> Student services funding = $395 per student for the first 4,000 headcount + $295 per student for the next 4,000 headcount + $265 per student for all students over 8,000 headcount.

Institutional Support Formulas

This category includes expenditures for the central executive level management of a campus, fiscal operations, administrative data processing, employee personnel services, and support services (NACUBO 1988). Table 8 displays information on the institutional support formulas used by the states. Alabama, Mississippi, South Carolina, and Tennessee multiply a specified percentage by all other E&G expenditures to calculate institutional support needs. Kentucky includes some differentiation and a base amount to recognize economies of scale and complexity of operation, Texas multiplies a specified rate by a measure of enrollment to determine institutional support amounts. All of these methods achieve vertical equity given that unequals are treated unequally. An example of an institutional support formula is shown below.

Institutional support = base amount + $150 per headcount student

Scholarships and Fellowships Formulas

This category encompasses all expenditures for scholarships and fellowships, including prizes, awards, federal grants, tuition and fee waivers, and other aid awarded to students for which services to the institution are not required (NACUBO 1988). Only Kentucky, Maryland, Mississippi, Montana, and Oklahoma calculate an allocation for scholarships and fellowships (Table 9). In each case except Oklahoma, which calculates the amount as a dollar value times the number of FTES, the formula amount is equal to a percent of tuition revenues. These approaches all provide horizontal equity but fail to provide vertical equity in that neither the cost to the student, nor the institution nor the student's ability to pay, are considered in the formula.

Table 8
Institutional Support Formulas

State	Calculation Method			Approach		Base				Differentiation			Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Head Count	Others	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari-able
Alabama		X		X		X				X	X			X
Arizona*			X		X	X			X		X			X
California*			X		X	X			X	X	X	X		X
Florida		X			X	X							X	X
Georgia*		X		X		X				X	X			X
Kansas*	X				X	X					X	X	X	X
Kentucky		X			X	X	X			X	X	X	X	X
Louisiana*	X				X	X				X	X	X		X
Maryland	X				X			X						X
Minnesota*	X				X				X	X	X	X		X
Mississippi		X			X	X				X	X	X		X
Missouri	X				X	X				X	X			X
Montana*	X			X										X
Nevada		X		X				X					X	X
New Mexico		X	X		X			X					X	X
North Dakota*	X			X			X						X	X
Ohio*	X				X	X			X				X	X
Oklahoma*	X				X	X			X	X	X	X		X
Oregon	X	X			X		X						X	X
Pennsylvania*	X				X	X			X				X	X
South Carolina		X		X		X			X	X	X		X	X
South Dakota*			X		X	X			X	X	X			X
Tennessee	X	X		X					X				X	X
Texas	X				X		X	X					X	X
Utah*			X		X	X				X	X	X		X
West Virginia*	X				X				X			X		X

* indicates more than one functional area included in this formula

Table 9
Scholarships and Fellowships Forumlas

State	Calculation Method			Approach		Base			Differentiation			Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	Credit Hours	Head Count	FTES/ FTEF	Disci-pline	Level	Type of Inst.	Fixed	Vari-able
Kentucky		X		X				X					X
Maryland		X		X				X					X
Mississippi		X		X				X					X
Montana		X		X				X					X
Oklahoma*	X				X	X	X		X	X	X		X

* indicates more than one functional area included in this formula

Operation and Maintenance of Plant Formulas

Table 10 displays information on the plant formulas used by the states. The plant category contains all expenditures for current operations and maintenance of the physical plant, including building maintenance, custodial services, utilities, landscape and grounds, and building repairs. Not included are expenditures made from plant fund accounts, or expenditures for hospitals, auxiliary enterprises, or independent operations (NACUBO 1988).

Connecticut, Oregon, South Carolina, and Texas use five formulas to calculate detailed plant needs. These complicated methods differentiate among types of building construction, usage of space, and size of institution. Horizontal equity is achieved in that equal dollars are provided for equal components of the physical plant. Moreover, differences among buildings are recognized and the unequal costs of maintaining, cooling, heating, and lighting each building are built into the formulas, resulting in vertical equity. An example of a simple plant formula is given below.

> Plant funding = $6.50 per gross square foot of frame buildings + $3.75 per gross square foot of brick or masonry buildings

Table 10
Plant Formulas

State	Calculation Method			Approach		Base					Differentiation		Costs	
	RPBF	PBF	BF PR/SR	All Inclusive	Item-ized	NSF/ GSF	Replc Cst	Acres	Credit Hours	FTES/ FTEF	Type of Building	Level	Fixed	Vari-able
Alabama	x				x	x					x	x		x
Arizona*			x		x				x	x		x		x
California*			x		x	x			x			x	x	x
Connecticut	x	x	x		x	x	x				x		x	x
Florida	x				x	x					x			x
Georgia	x				x	x								x
Kansas	x		x		x	x								x
Kentucky	x	x			x	x					x			x
Louisiana*	x				x	x								x
Maryland	x	x			x	x	x							x
Minnesota*	x				x					x		x		x
Mississippi	x				x	x					x			x
Missouri	x				x	x					x	x		x
Nevada		x	x		x	x	x	x						x
New Mexico			x		x	x					x			x
North Dakota	x				x		x	x		x		x		x
Ohio	x				x	x				x	x	x	x	x
Oklahoma*	x				x	x				x		x		x
Oregon	x	x	x		x	x		x			x			x
Pennsylvania	x				x	x	x					x	x	x
South Carolina	x		x		x	x	x	x		x	x			x
South Dakota*			x		x					x				x
Tennessee	x				x	x			x		x			x
Texas	x		x		x	x	x	x		x	x		x	x
Utah*			x		x	x								x
West Virginia*	x				x					x		x		x

* indicates more than one functional area included in this formula

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TRENDS IN THE USE OF FUNDING FORMULAS

As was mentioned earlier, there appears to have been a watershed in the use of funding formulas in the budgeting and resource allocation process for higher education institutions. On the one hand, formulas are becoming more complex; on the other hand, states that have used formulas for nearly a quarter century are abandoning their use. In the place of formulas, productivity measures and other accountability techniques are being used to measure institutional performance and allocate resources. In addition, as state support for higher education stagnates, institutions are attempting to protect their base budgets by using an incremental approach to funding over the base formula-developed budget.

Formulas are becoming more sophisticated or complex, especially in the increase in the number of formulas within a budget area (e.g., instruction) and the differentiation within the formulas. The added complexity appears to be a recognition of differences in roles and missions and in costs among academic programs. From a technical or public policy standpoint, the increased complexity can be perceived to be positive. Formulas that more closely model reality, or that which is considered reality, always are preferable to more simplistic models. However, legislators, governors and other state policymakers who are the ultimate "consumers" of formulas generally prefer a formula that is simple to understand.

Institutions appear to be protecting their base budgets by going to incremental budgeting in place of formula budgeting. Several states that had used funding formulas for at least a decade now use the incremental budgeting method. The base budget, however, was computed by formula, so several of these states consider themselves to be "formula states." As state funding for higher education becomes more scarce, institutions understandably are concerned with maintaining the funding they have with minimal restrictions from the state. Formulas are, in effect, a zero-based budgeting method under which each institution justifies its request for state

funds each year. Maintenance of the base can become the primary goal when enrollment declines or shifts into less expensive course offerings.

Many states adopted formula usage to provide and/or achieve equity in the distribution of resources. In the southern states, the provision of equity through a formula appears to be directly related to desegregation orders filed by the federal government. (It also is possible that these equity features are spillovers from state concerns with equity in K-12 funding formulas.) However, no attempt is made to determine whether a formula is "more" or "less" equitable in the distribution of state resources to institutions. Evaluations of formulas, and their impacts, like those done for elementary and secondary education using range ratios, gini coefficients, or other equity measures, are not used yet in higher education, except in a few federal court cases.

Now that states appear to be dropping formula use for four-year higher education, is this a shift away from the commitment to achieve goals of adequacy and equity in the distribution of resources, to a commitment to goals of efficiency and accountability? Clearly, the higher education industry has fallen on hard times in many states (Harman 1995). Many institutions have suffered from absolute cuts in state funding during the 1990s. Tuition and fees have risen dramatically, and enrollments in some states have declined or shifted among institutions. Perhaps the switch away from funding formulas is merely a reflection of the hard times that necessitate a protection of the base budget rather than a movement away from equity and adequacy.

But, maintenance of the base may not be possible when the general public seems to no longer be a willing participant in its love affair with higher education. Hardly a week goes by when the popular media does not have a story pointing out the indiscretions of higher education. Legislators have been calling for reform and accountability fueled by stories of how industries have been restructuring their budgets, rethinking their strategic plans, reorganizing, and reengineering the corporation to be more efficient and produce higher quality outputs. Corporate

leaders, long-time supporters of higher education, have called on institutions to reinvent themselves, to rethink their missions (and return to teaching as the primary mission), and to adopt continuous quality improvements (Harman 1995), just as industry has done. The movement to accountability and performance measures suggests that a watershed may have been reached in the way in which higher education is funded. Perhaps it is time for a new paradigm.

And perhaps the new paradigm is the movement to "productivity" formulas. Tennessee has included productivity measures as a formula component for more than a decade. Colorado now distributes some funds based on productivity measures, and Florida begins its productivity component for four-year institutions in 1997. Arizona, Kentucky, Minnesota, Missouri, Ohio, and Oklahoma have or are developing productivity components to the funding process. In total, fourteen states indicate that they are using productivity components in funding, up from eight reported in 1995 (Caruthers and Layzell 1995). Arkansas, a long-time user of funding formulas, abandoned its formulas to go to productivity funding. This is a significant change.

Some observers (Odden and Clune 1995) call for a restructuring or reinventing of education finance to address the issue of productivity or accountability. They assert that changing state school finance structures and restructuring teacher compensation systems will result in increased student achievement and productivity. Perhaps a new paradigm for higher education funding would lead to increased productivity and student achievement. The challenge to higher education finance researchers and analysts is to develop that new paradigm.

Formulas never will solve the resource allocation problems in higher education. Formulas cannot recognize the full range of objective and subjective differences among institutions, nor can they anticipate changes in the missions of institutions, such as those changes that will come about with the advent of "virtual" universities. Formulas do provide an objective allocation mechanism that can provide more equity than independent funding of each institution with the

power plays and patronage that inevitably characterize such allocation decisions. Determining the method for funding higher education will continue to be part of a political process that involves the art of compromise. Compromise will be necessary to preserve and improve the quality of public higher education and to accommodate the changing condition of education in the new millennium. Perhaps the promise will never be fulfilled, not because the goals were unworthy, but because the goals have changed.

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